

**Banks Lake Flow Augmentation  
Hydrologic Study Results  
Final for Draft EIS  
March 29,2002**

**Background**

The National Marine Fisheries Service December 2000 Biological Opinion<sup>1</sup> (FCRPS BiOp) states that Reclamation should perform an evaluation of the effects of drafting Banks Lake to elevation 1560 feet during the month of August. This action is to provide additional water downstream to meet flow objectives in the Columbia River during the out-migration of ESA listed juvenile salmonid stocks.

The current operation of Banks Lake is to restrict pumping from Lake Roosevelt and allow the lake to be drafted to elevation 1565 feet. This measure is described in Reasonable and Prudent Alternative Action No. 25 of the FCRPS BiOp, effective during the summer of 2001.

**General**

This document provides the hydrologic comparison of the current operation and the proposed operation. The current operation allows Banks Lake to be drafted to elevation 1565 feet. The proposed operation would allow Banks Lake to be drafted an additional five feet to elevation 1560 feet. Full Pool at Banks Lake is at elevation 1570 feet. The Lake typically operates during most of the year within 1 foot of elevation 1568 feet.

Banks Lake has a twofold function; providing pumped storage for peaking power operations associated with the Grand Coulee Project and storing irrigation for the Columbia Basin Project. The water in Banks Lake must be pumped from Franklin Delano Roosevelt Lake (FDR) behind Grand Coulee Dam through pumps and pump/generators on the west side of the FDR.

The 1990-level irrigation depletions for the Columbia Basin Project were used to determine the rates of draft for Banks Lake. See Table 1. The pumping rates for first and second half of August are 7,923 cfs and 6,750 cfs respectively. The irrigation diversions can be provided from Banks Lake down to elevation 1545 feet.

The volume of storage above elevation 1565 is 133,600 acre-feet. The volume of storage between the elevations of 1565 feet and 1560 feet is 127,200 acre-feet, which is equivalent to approximately 1.8 feet of depth in FDR Lake (at elevation 1278 feet). The storage/elevation curve for Banks Lake is shown in Figure 1 in the Appendix.

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<sup>1</sup> National Marine Fisheries Service – Northwest Region, “Endangered Species Act – Section 7 Consultation, Biological Opinion – Re-initiation of Consultation on Operation of the Federal Columbia River power System including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin” December 21, 2000 pg. 9-71

## **Hydrologic Modeling**

The primary focus of the modeling was to quantify the potential contribution of the volume of the proposed draft of Banks Lake at McNary Dam downstream. Hydro-simulation data, provided by the Bonneville Power Administration, were used to model the alternatives.

The 2000 BiOp studies include drafting Banks Lake to elevation 1565 feet, so resulting flows at McNary were used as the base flow for this study. The additional flows resulting from the various draft alternatives at Banks Lake are added and subtracted from the modeled flows at McNary Dam.

The hydro-simulation data is the output from the FCRPS studies that reflect operations in compliance with the 2000 Biological Opinion (BiOp). The hydro-simulation uses the historical hydrologic and meteorologic data sets over the period 1929-1978, current system configuration and operating requirements to compute the flows that would have occurred if the system and its constraints existed in those years.

This analysis focused on increasing the draft of Banks Lake during the month of August. The draft of Banks Lake was modeled by reducing the pumping from FDR Lake and allowing the irrigation demand to draft Banks Lake. Once the target elevation for Banks Lake is met pumping is resumed to hold that elevation through the end of August. Downstream flows are increased by the reduction in pumping rate.

The study is based on the assumption that Banks Lake is full on August 1; therefore the results are conservative. Actual August 1 starting elevation at Banks Lake could be less than elevation 1570 feet due to unplanned pump outages, power emergencies, electrical problems, and any other unforeseen events. The Bureau of Reclamation would make every reasonable effort to be as close to a pool elevation of 1570 feet as practicable.

The flow target at McNary for salmon is 200,000 cfs for the entire month of August. For this simplified analysis, the value of 195,000 cfs is used in lieu of the actual flow objective of 200,000 cfs to compensate for modeling uncertainty. This produces results that more realistically represent the number of years that the flow objective would be met.

## **No Action Alternative**

The No Action alternative drafts Banks Lake a total of five feet. Four different operating scenarios were modeled. This alternative assumes that beginning August 1<sup>st</sup> the pool elevation is at 1570 feet. The volume of water between elevation 1570 feet and 1565 feet is equivalent to 133,600 acre-feet. The four operating scenarios include:

Low Water – Assumes that Banks Lake was drafted five feet prior to August 1 and held at elevation 1565 feet throughout August.

Uniform Draft - Draft Banks Lake evenly through August. This is equivalent to a flow rate of 2,173 cfs.

Early Draft - Draft Banks Lake evenly from August 1 through August 15. This is equivalent to a flow rate of 4,490 cfs.

Late Draft - Draft Banks Lake evenly from August 16 through August 31. This is equivalent to a flow rate of 4,209 cfs.

### **Action Alternative**

The Action alternative evaluates the impacts of drafting Banks Lake up to 10 feet. Four different operating scenarios were modeled. These scenarios assume different starting elevations on August 1 and different draft rates, but all have Banks Lake at elevation 1560 feet by the end of the month. August is modeled as two periods, the first covers the first 15 days of the month and the second covers the last 16 days of the month.

Low Water Early Draft – (As suggested by NMFS) Assume that Banks Lake was drafted to pool elevation 1565 prior to August 1, and is drafted to elevation 1560 in August. This is a draft of 127,200 acre-feet at a rate of 4,275 cfs for August 1-15.

Uniform Draft - Assume that the pool elevation is at 1570 feet on August 1 and is drafted evenly through August. This is equivalent to 260,800 acre-feet at a rate of 4,242 cfs.

Early Draft - Assume that the pool is at elevation 1570 feet on August 1 and is drafted at the scheduled pumping rates of 7,923 cfs and 6,750 cfs for the first and second half of August respectively. This is equivalent to 235,724 acre-feet at a rate of 7,923 cfs from August 1-15. The remaining 25,076 acre-feet will be drafted from August 16-31 at a rate of 790 cfs.

Late Draft – Assume the pool would be maintained at elevation 1570 feet until August 11 and then drafted by the expected irrigation demand reaching elevation 1560 feet at the end of August. This operation is simulated in the model by using a flow of 1,468 cfs over the August 1-15 time period and 6,750 cfs or 214,213 acre-feet from August 16-31.

**Table 1 Flow Contributions at McNary Dam.**

<b>Alternatives</b>	<b>Potential Flow Contribution at McNary Dam (cfs per day)</b>		<b>Number of Years the Flow at McNary Dam Met or Exceeded 195 kcfs (within 1 kcfs)</b>	
	<b>August 1-15</b>	<b>August 16-31</b>	<b>August 1-15</b>	<b>August 16-31</b>
<b>No Action Alternative.</b>				
<b>Low Water</b> – Banks Lake drafted to 1565 prior to August 1 and held at elevation 1565 feet through August	0	0	20	5
<b>Uniform Draft</b> - 5 feet of Draft at Banks from Elevation 1570 to 1565 spread evenly through August.	2173	2173	21	6
<b>Early Draft</b> - 5 feet of Draft at Banks from 1570 to 1565 spread evenly from August 1 to August 15.	4490	0	21	5
<b>Late Draft</b> - 5 feet of Draft at Banks from 1570 to 1565 spread evenly from August 16 to August 31.	0	4209	21	6
<b>Action Alternative.</b>				
<b>Low Water Early Draft</b> – Banks Lake drafted to 1565 prior to August 1, then 5 feet of draft at Banks from Elevation 1565 to 1560 drafted at the expected irrigation demand in the first half of August.	4275	0	21	5
<b>Uniform Draft</b> - 10 feet of Draft at Banks from Elevation 1570 to 1560 spread evenly through August.	4242	4242	21	6
<b>Early Draft</b> - 10 feet of draft at Banks from Elevation 1570 to 1560 drafted at the average expected irrigation demand for each half of August. (In actuality, it is expected to take approximately 17 days for this draft to occur at a rate of 7,923 cfs for Aug 1-15 and 6,750 cfs for Aug 16-17).	7923	790	21	5
<b>Late Draft</b> - 10 feet of draft at Banks from Elevation 1570 to 1560 drafted at the average expected irrigation demand. (In actuality it is expected, to take approximately 19 days for this draft to occur starting on Aug 12 at 7,923 cfs through Aug 15 then at 6,750 cfs for Aug 16-31).	1468	6750	21	7

## **Results**

### **A. Effects of the Draft of Banks Lake on Columbia River Flows**

Drafting Banks Lake from elevations 1570 feet to 1565 feet during the month of August will increase streamflow in the Columbia River at McNary and will complement other actions. Drafting an additional five feet to elevation 1560 feet will provide some additional benefit. Depending on the timing and duration of the operation, streamflows may increase by as much as 8,000 cfs. Actual contributions could vary as real-time decisions are made through adaptive management in consideration of actual streamflows, fish migration conditions, operation requests from Salmon Managers, unplanned equipment outages, power emergencies, or any other unforeseen event.

It should be noted that the years that flow objectives were met covered a wide range of annual flow volumes. The timing of the runoff can vary greatly between similar runoff volumes. It is noteworthy that 195,000 cfs is significantly higher than the historic average flows and increasing flows by the addition of 2-8 kcfs will not significantly increase the probability of meeting the BiOp flow objective at McNary.

Results of the evaluation show that a contribution of five feet of water from Banks Lake makes a small difference to the McNary flows during the August time periods. By drafting an additional five feet of water from Banks Lake, flow targets at McNary Dam can be met one more time in the second half of August. The number of years the flow at McNary Dam met or exceeded 195,000 cfs, within 1 kcfs, with this additional volume is presented in [Table 1](#).

Although, Banks Lake's normal operating range typically remains above elevation 1568, a daily average pool elevation of 1570 is only experienced 20 % of the time in the last 20 years. If the starting pool elevation is less than 1570 the flow contributions in August as presented will be less. However, this does not mean that the overall flow contribution to the system is diminished. A starting pool elevation of less than 1570 on August 1 shifts that part of the contribution to an earlier time period.

### **B. Effect of Banks Lake Refill**

The refill of Banks Lake will likely occur during periods where smaller loads on the power system are typically experienced. The rate of refill of Banks Lake will be variable and unique each year.

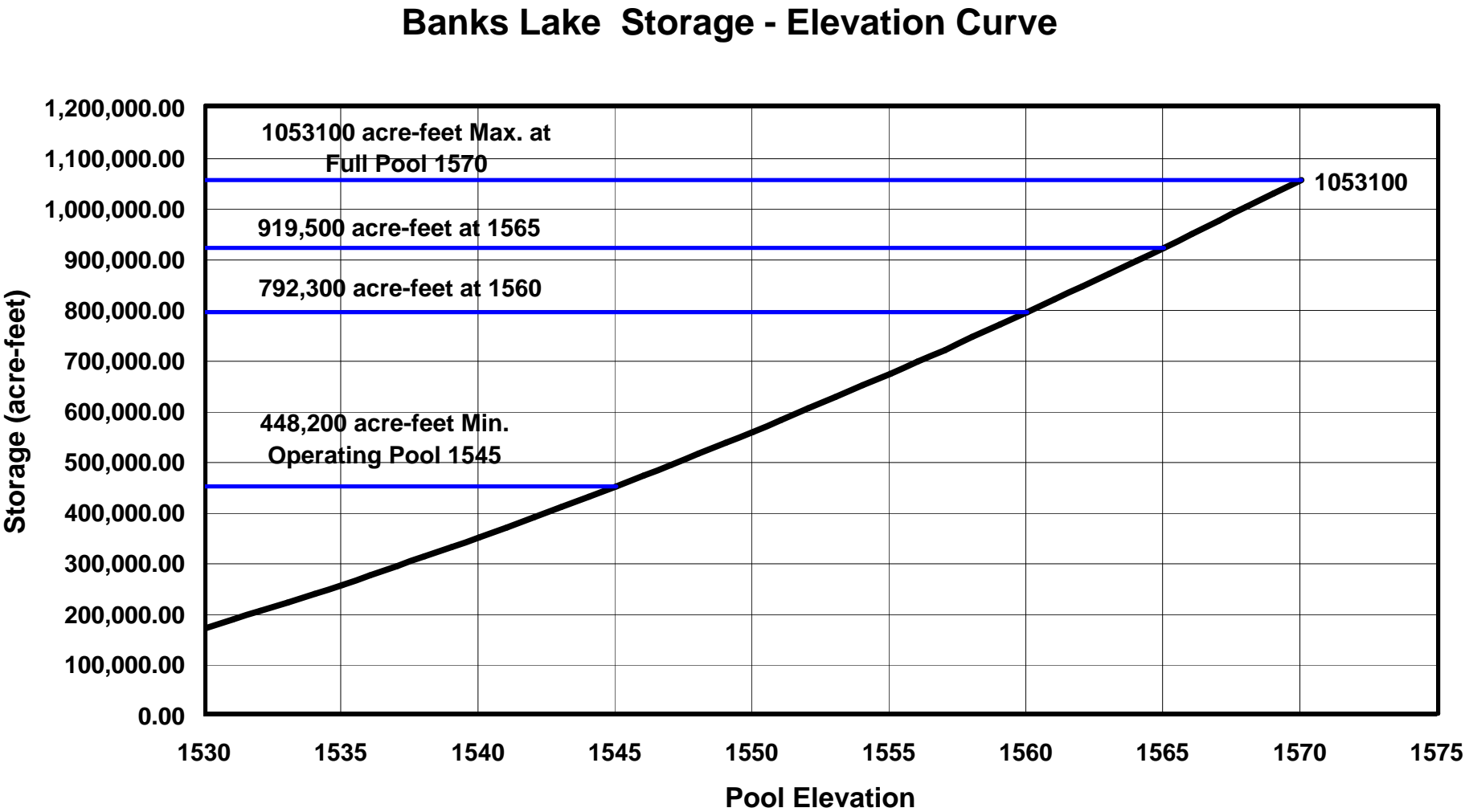
The water removed from FDR to refill Banks Lake is a small increment of the flow in the Columbia River. Labor Day and Thanksgiving Day weekends commonly provide good conditions for pumping into Banks Lake. The refill operations typically avoid periods where flow minimums for fish migration are in effect.

The project has the capability to refill from elevation 1565 to 1570 in less than four days. However, system conditions will dictate the rate of refill.

Irrigation demands on Banks Lake diminish in September and can disappear completely in October. A reasonable assumption for the refill would be no net gain on weekdays and pumping in small increments over each weekend. This will refill Banks Lake gradually while taking advantage of holiday or other periods of smaller system loads. It is also reasonable to assume that the pool will reach 1568 by the end of Thanksgiving weekend.

## **APPENDIX**

Figure 1. Storage/Elevation Curve





**Figure 2. Banks Lake Forebay Exceedance Curve.**

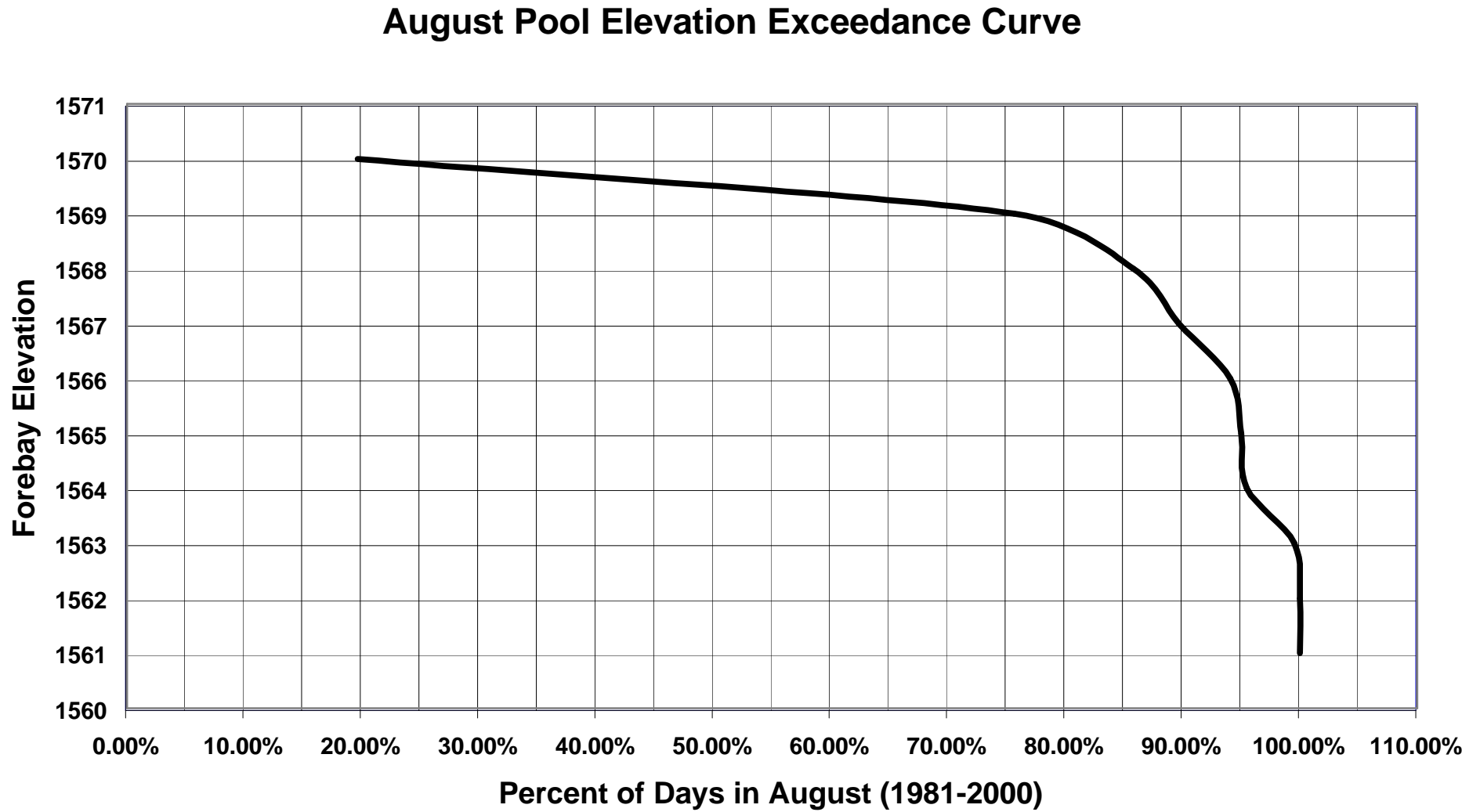


Figure 3. 1980-1989 Historical Banks Lake Pool Elevations.

### 1980-1989 Historical Banks Lake Pool Elevations

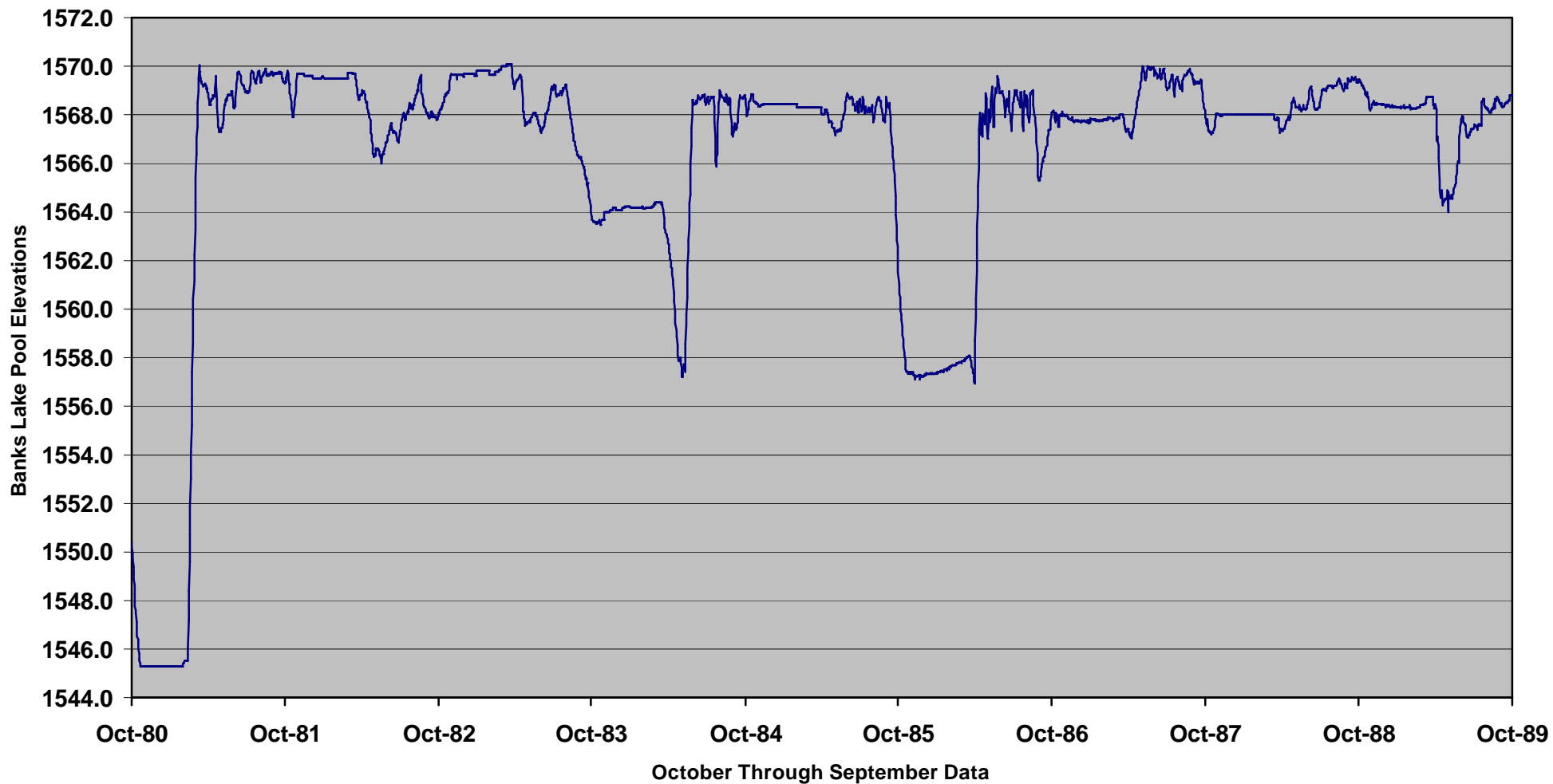


Figure 4. Historical Banks Lake Pool Elevations 1990-1999

### 1990-1999 Historical Banks Lake Pool Elevations

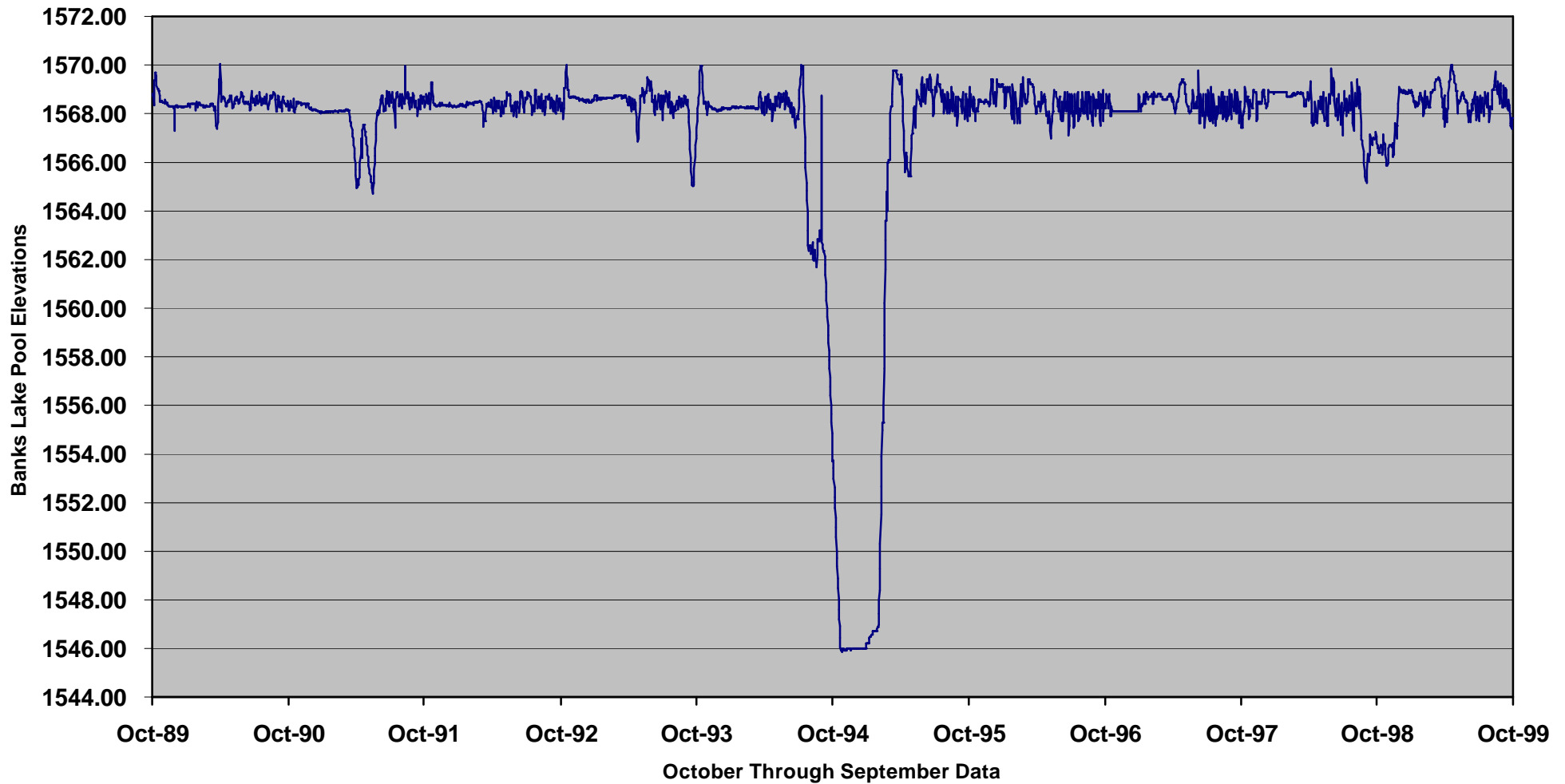
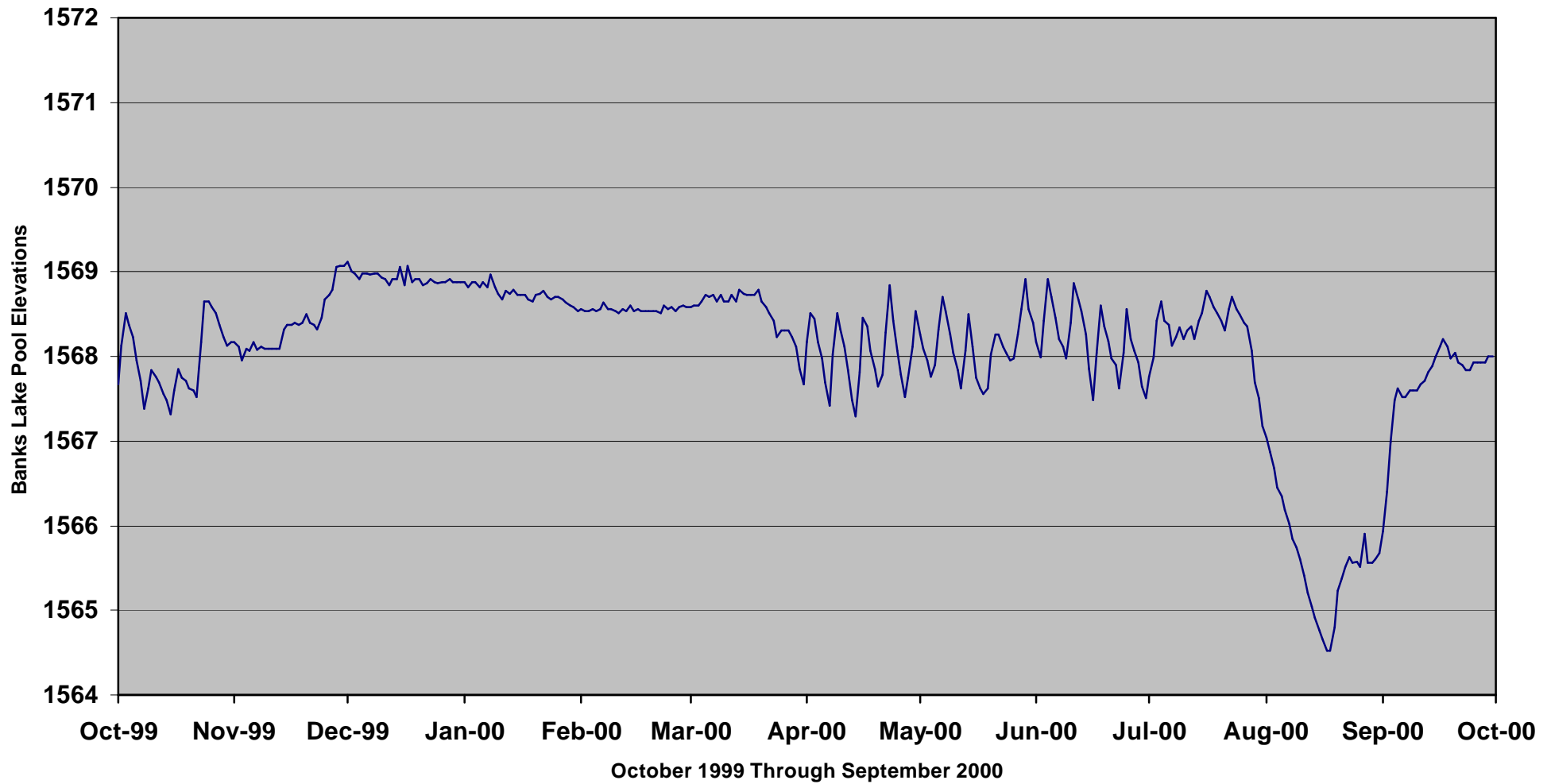


Figure 5. Historical Banks Lake Pool Elevation for Year 2000

### Historical Banks Lake Pool Elevations October 1999 Through September 2000



**Table 2. Modeled Flow Data (cfs) for Each Scenario of the No-Action Alternative.**

Year	Volume (Maf)	Low Water		Uniform Draft		Early Draft		Late Draft	
		August 1-15	August 16-31	August 1-15	August 16-31	August 1-15	August 16-31	August 1-15	August 16-31
28		179140	126238	181,313	128,411	183,630	126,238	179,140	130,447
29	68.4	126893	117858	129,066	120,031	131,383	117,858	126,893	122,067
30	70.0	137659	106062	139,832	108,235	142,149	106,062	137,659	110,271
31	64.4	146619	116052	148,792	118,225	151,109	116,052	146,619	120,261
32	106.1	170296	158958	172,469	161,131	174,786	158,958	170,296	163,167
33	108.1	197815	197952	199,988	200,125	202,305	197,952	197,815	202,161
34	110.6	130411	106341	132,584	108,514	134,901	106,341	130,411	110,550
35	90.9	195650	132241	197,823	134,414	200,140	132,241	195,650	136,450
36	88.6	166081	123889	168,254	126,062	170,571	123,889	166,081	128,098
37	69.2	152657	108821	154,830	110,994	157,147	108,821	152,657	113,030
38	106.1	158139	125489	160,312	127,662	162,629	125,489	158,139	129,698
39	81.0	145760	124337	147,933	126,510	150,250	124,337	145,760	128,546
40	80.8	141349	110666	143,522	112,839	145,839	110,666	141,349	114,875
41	69.5	149044	121096	151,217	123,269	153,534	121,096	149,044	125,305
42	90.6	163078	143548	165,251	145,721	167,568	143,548	163,078	147,757
43	117.4	195247	160561	197,420	162,734	199,737	160,561	195,247	164,770
44	60.1	124311	99854	126,484	102,027	128,801	99,854	124,311	104,063
45	82.3	142378	135569	144,551	137,742	146,868	135,569	142,378	139,778
46	111.4	195663	146591	197,836	148,764	200,153	146,591	195,663	150,800
47	106.2	178481	136743	180,654	138,916	182,971	136,743	178,481	140,952
48	130.8	197815	193156	199,988	195,329	202,305	193,156	197,815	197,365
49	101.9	136313	102133	138,486	104,306	140,803	102,133	136,313	106,342
50	123.8	197815	190573	199,988	192,746	202,305	190,573	197,815	194,782
51	124.5	197815	169127	199,988	171,300	202,305	169,127	197,815	173,336
52	112.6	183815	137054	185,988	139,227	188,305	137,054	183,815	141,263
53	105.8	194823	158205	196,996	160,378	199,313	158,205	194,823	162,414
54	117.9	226570	197952	228,743	200,125	231,060	197,952	226,570	202,161
55	96.4	197815	177766	199,988	179,939	202,305	177,766	197,815	181,975
56	139.9	196761	163308	198,934	165,481	201,251	163,308	196,761	167,517
57	112.3	158572	119584	160,745	121,757	163,062	119,584	158,572	123,793
58	107.1	154761	130484	156,934	132,657	159,251	130,484	154,761	134,693
59	117.8	197815	157290	199,988	159,463	202,305	157,290	197,815	161,499
60	101.8	197815	123767	199,988	125,940	202,305	123,767	197,815	127,976
61	111.2	158859	135810	161,032	137,983	163,349	135,810	158,859	140,019
62	96.9	179011	143587	181,184	145,760	183,501	143,587	179,011	147,796
63	94.1	184344	150778	186,517	152,951	188,834	150,778	184,344	154,987
64	106.6	197815	168106	199,988	170,279	202,305	168,106	197,815	172,315
65	125.6	197815	166526	199,988	168,699	202,305	166,526	197,815	170,735
66	89.5	186911	131737	189,084	133,910	191,401	131,737	186,911	135,946
67	112.6	197815	156565	199,988	158,738	202,305	156,565	197,815	160,774

68	95.3	197815	162411	199,988	164,584	202,305	162,411	197,815	166,620
69	122.1	157964	123399	160,137	125,572	162,454	123,399	157,964	127,608
70	96.1	151894	127260	154,067	129,433	156,384	127,260	151,894	131,469
71	138.5	200316	183824	202,489	185,997	204,806	183,824	200,316	188,033
72	151.6	214793	197952	216,966	200,125	219,283	197,952	214,793	202,161
73	70.9	128860	99602	131,033	101,775	133,350	99,602	128,860	103,811
74	156.1	203052	197952	205,225	200,125	207,542	197,952	203,052	202,161
75	111.4	159200	146959	161,373	149,132	163,690	146,959	159,200	151,168
76	121.8	242817	227273	244,990	229,446	247,307	227,273	242,817	231,482
77	53.5	138405	108174	140,578	110,347	142,895	108,174	138,405	112,383

**Table 3. Modeled Flow Data (cfs) for Each Scenario of the Action Alternative.**

Year	Volume (Maf)	Low Water Early Draft		Uniform Draft		Early Draft		Late Draft	
		August 1-15	August 16-31	August 1-15	August 16-31	August 1-15	August 16-31	August 1-15	August 16-31
28		183,415	126,238	183,382	130,480	187,063	127,028	180,608	132,988
29	68.4	131,168	117,858	131,135	122,100	134,816	118,648	128,361	124,608
30	70.0	141,934	106,062	141,901	110,304	145,582	106,852	139,127	112,812
31	64.4	150,894	116,052	150,861	120,294	154,542	116,842	148,087	122,802
32	106.1	174,571	158,958	174,538	163,200	178,219	159,748	171,764	165,708
33	108.1	202,090	197,952	202,057	202,194	205,738	198,742	199,283	204,702
34	110.6	134,686	106,341	134,653	110,583	138,334	107,131	131,879	113,091
35	90.9	199,925	132,241	199,892	136,483	203,573	133,031	197,118	138,991
36	88.6	170,356	123,889	170,323	128,131	174,004	124,679	167,549	130,639
37	69.2	156,932	108,821	156,899	113,063	160,580	109,611	154,125	115,571
38	106.1	162,414	125,489	162,381	129,731	166,062	126,279	159,607	132,239
39	81.0	150,035	124,337	150,002	128,579	153,683	125,127	147,228	131,087
40	80.8	145,624	110,666	145,591	114,908	149,272	111,456	142,817	117,416
41	69.5	153,319	121,096	153,286	125,338	156,967	121,886	150,512	127,846
42	90.6	167,353	143,548	167,320	147,790	171,001	144,338	164,546	150,298
43	117.4	199,522	160,561	199,489	164,803	203,170	161,351	196,715	167,311
44	60.1	128,586	99,854	128,553	104,096	132,234	100,644	125,779	106,604
45	82.3	146,653	135,569	146,620	139,811	150,301	136,359	143,846	142,319
46	111.4	199,938	146,591	199,905	150,833	203,586	147,381	197,131	153,341
47	106.2	182,756	136,743	182,723	140,985	186,404	137,533	179,949	143,493
48	130.8	202,090	193,156	202,057	197,398	205,738	193,946	199,283	199,906
49	101.9	140,588	102,133	140,555	106,375	144,236	102,923	137,781	108,883
50	123.8	202,090	190,573	202,057	194,815	205,738	191,363	199,283	197,323
51	124.5	202,090	169,127	202,057	173,369	205,738	169,917	199,283	175,877
52	112.6	188,090	137,054	188,057	141,296	191,738	137,844	185,283	143,804
53	105.8	199,098	158,205	199,065	162,447	202,746	158,995	196,291	164,955
54	117.9	230,845	197,952	230,812	202,194	234,493	198,742	228,038	204,702
55	96.4	202,090	177,766	202,057	182,008	205,738	178,556	199,283	184,516
56	139.9	201,036	163,308	201,003	167,550	204,684	164,098	198,229	170,058
57	112.3	162,847	119,584	162,814	123,826	166,495	120,374	160,040	126,334
58	107.1	159,036	130,484	159,003	134,726	162,684	131,274	156,229	137,234
59	117.8	202,090	157,290	202,057	161,532	205,738	158,080	199,283	164,040
60	101.8	202,090	123,767	202,057	128,009	205,738	124,557	199,283	130,517
61	111.2	163,134	135,810	163,101	140,052	166,782	136,600	160,327	142,560
62	96.9	183,286	143,587	183,253	147,829	186,934	144,377	180,479	150,337
63	94.1	188,619	150,778	188,586	155,020	192,267	151,568	185,812	157,528
64	106.6	202,090	168,106	202,057	172,348	205,738	168,896	199,283	174,856
65	125.6	202,090	166,526	202,057	170,768	205,738	167,316	199,283	173,276
66	89.5	191,186	131,737	191,153	135,979	194,834	132,527	188,379	138,487
67	112.6	202,090	156,565	202,057	160,807	205,738	157,355	199,283	163,315
68	95.3	202,090	162,411	202,057	166,653	205,738	163,201	199,283	169,161
69	122.1	162,239	123,399	162,206	127,641	165,887	124,189	159,432	130,149
70	96.1	156,169	127,260	156,136	131,502	159,817	128,050	153,362	134,010
71	138.5	204,591	183,824	204,558	188,066	208,239	184,614	201,784	190,574
72	151.6	219,068	197,952	219,035	202,194	222,716	198,742	216,261	204,702

73	70.9	133,135	99,602	133,102	103,844	136,783	100,392	130,328	106,352
74	156.1	207,327	197,952	207,294	202,194	210,975	198,742	204,520	204,702
75	111.4	163,475	146,959	163,442	151,201	167,123	147,749	160,668	153,709
76	121.8	247,092	227,273	247,059	231,515	250,740	228,063	244,285	234,023
77	53.5	142,680	108,174	142,647	112,416	146,328	108,964	139,873	114,924



**Table 4. First of Month Banks Lake Pool Elevation (feet) 1980-2000.**

Date	Elevation	Date	Elevation	Date	Elevation
10/01/80	1550.5	10/01/87	1568.0	10/01/94	1553.7
11/01/80	1545.3	11/01/87	1568.0	11/01/94	1546.0
12/01/80	1545.3	12/01/87	1568.0	12/01/94	1546.0
01/01/81	1545.3	01/01/88	1568.0	01/01/95	1546.2
02/01/81	1545.4	02/01/88	1568.0	02/01/95	1546.9
03/01/81	1563.3	03/01/88	1568.0	03/01/95	1566.1
04/01/81	1568.9	04/01/88	1567.4	04/01/95	1569.4
05/01/81	1567.3	05/01/88	1568.6	05/01/95	1567.0
06/01/81	1568.3	06/01/88	1568.5	06/01/95	1568.7
07/01/81	1569.0	07/01/88	1568.5	07/01/95	1568.3
08/01/81	1569.8	08/01/88	1569.1	08/01/95	1568.5
09/01/81	1569.7	09/01/88	1569.1	09/01/95	1567.5
10/01/81	1569.3	10/01/88	1569.5	10/01/95	1568.6
11/01/81	1569.7	11/01/88	1568.4	11/01/95	1568.5
12/01/81	1569.6	12/01/88	1568.4	12/01/95	1569.1
01/01/82	1569.5	01/01/89	1568.3	01/01/96	1569.1
02/01/82	1569.5	02/01/89	1568.3	02/01/96	1567.6
03/01/82	1569.7	03/01/89	1568.4	03/01/96	1568.8
04/01/82	1568.8	04/01/89	1568.3	04/01/96	1568.0
05/01/82	1566.3	05/01/89	1564.0	05/01/96	1567.8
06/01/82	1566.9	06/01/89	1567.7	06/01/96	1568.7
07/01/82	1567.2	07/01/89	1567.4	07/01/96	1568.0
08/01/82	1568.3	08/01/89	1568.3	08/01/96	1568.1
09/01/82	1568.2	09/01/89	1568.6	09/01/96	1568.8
10/01/82	1568.0	10/01/89	1568.8	10/01/96	1568.4
11/01/82	1569.7	11/01/89	1568.5	11/01/96	1568.1
12/01/82	1569.7	12/01/89	1567.3	12/01/96	1568.1
01/01/83	1569.8	01/01/90	1568.3	01/01/97	1568.8
02/01/83	1569.7	02/01/90	1568.3	02/01/97	1568.7
03/01/83	1570.0	03/01/90	1568.3	03/01/97	1568.7
04/01/83	1569.1	04/01/90	1570.0	04/01/97	1568.6
05/01/83	1567.7	05/01/90	1568.8	05/01/97	1569.3
06/01/83	1567.4	06/01/90	1568.7	06/01/97	1568.5
07/01/83	1569.2	07/01/90	1568.6	07/01/97	1568.3
08/01/83	1569.2	08/01/90	1568.5	08/01/97	1568.0
09/01/83	1566.2	09/01/90	1568.1	09/01/97	1569.0
10/01/83	1564.0	10/01/90	1568.4	10/01/97	1568.0
11/01/83	1564.0	11/01/90	1568.4	11/01/97	1568.2
12/01/83	1564.1	12/01/90	1568.3	12/01/97	1569.0
01/01/84	1564.2	01/01/91	1568.1	01/01/98	1568.9
02/01/84	1564.1	02/01/91	1568.1	02/01/98	1568.7
03/01/84	1564.4	03/01/91	1568.1	03/01/98	1568.8
04/01/84	1562.7	04/01/91	1565.5	04/01/98	1568.5
05/01/84	1557.8	05/01/91	1566.7	05/01/98	1568.3
06/01/84	1568.4	06/01/91	1567.9	06/01/98	1569.7
07/01/84	1568.6	07/01/91	1568.8	07/01/98	1567.4

08/01/84	1568.9	08/01/91	1568.4	08/01/98	1568.3
09/01/84	1567.1	09/01/91	1568.7	09/01/98	1565.3
10/01/84	1568.7	10/01/91	1568.6	10/01/98	1566.8
11/01/84	1568.4	11/01/91	1568.4	11/01/98	1566.3
12/01/84	1568.5	12/01/91	1568.3	12/01/98	1569.1
01/01/85	1568.5	01/01/92	1568.3	01/01/99	1568.9
02/01/85	1568.3	02/01/92	1568.5	02/01/99	1568.3
03/01/85	1568.3	03/01/92	1568.5	03/01/99	1569.0
04/01/85	1568.0	04/01/92	1568.1	04/01/99	1568.8
05/01/85	1567.4	05/01/92	1568.0	05/01/99	1568.9
06/01/85	1568.8	06/01/92	1568.5	06/01/99	1568.3
07/01/85	1568.7	07/01/92	1568.6	07/01/99	1568.1
08/01/85	1567.9	08/01/92	1568.4	08/01/99	1568.3
09/01/85	1568.1	09/01/92	1568.7	09/01/99	1568.5
10/01/85	1561.5	10/01/92	1568.2	10/01/99	1567.7
11/01/85	1557.4	11/01/92	1568.7	11/01/99	1568.2
12/01/85	1557.3	12/01/92	1568.6	12/01/99	1569.1
01/01/86	1557.4	01/01/93	1568.8	01/01/00	1568.9
02/01/86	1557.6	02/01/93	1568.7	02/01/00	1568.6
03/01/86	1557.9	03/01/93	1568.7	03/01/00	1568.6
04/01/86	1557.7	04/01/93	1568.4	04/01/00	1568.2
05/01/86	1567.0	05/01/93	1568.2	05/01/00	1568.3
06/01/86	1569.0	06/01/93	1569.2	06/01/00	1568.2
07/01/86	1568.5	07/01/93	1568.0	07/01/00	1567.8
08/01/86	1568.3	08/01/93	1568.3	08/01/00	1567.0
09/01/86	1565.4	09/01/93	1568.6	09/01/00	1565.9
10/01/86	1568.1	10/01/93	1567.4		
11/01/86	1568.0	11/01/93	1568.4		
12/01/86	1567.8	12/01/93	1568.2		
01/01/87	1567.9	01/01/94	1568.2		
02/01/87	1567.8	02/01/94	1568.3		
03/01/87	1567.8	03/01/94	1568.3		
04/01/87	1567.4	04/01/94	1568.0		
05/01/87	1569.4	05/01/94	1568.7		
06/01/87	1569.9	06/01/94	1568.7		
07/01/87	1569.2	07/01/94	1568.0		
08/01/87	1569.2	08/01/94	1562.6		
09/01/87	1569.6	09/01/94	1562.8		